

## **REMARKS**

### **Claims Status**

Applicant acknowledges, with appreciation, the indication that claims 2-3, 6-7, 11, 14-15, 16-19, 23-26, 30, 32 and 35-39 contain allowable subject matter. Claims 1-3, 5-11, 13-19, 22-27, 29-32 and 34-41 are now presented for examination, with claims 1, 10, 22, 31 and 40 being in independent form.

Claims 4, 12, 28 and 33 have been canceled. Claims 1, 5, 9, 10, 13, 18, 22, 29, 31, 34, 35, 37, 40 and 41 have been amended. Independent claim 1 has been amended to incorporate the subject matter of canceled dependent claim 4. Independent claim 10 has been amended to incorporate the subject matter of canceled dependent claim 12. Independent claim 22 has been amended to incorporate the subject matter of canceled dependent claim 28. Independent claim 31 has been amended to incorporate the subject matter of canceled dependent claim 33. The amendments to dependent claims 9, 18, 35 and 37 clarify the wording of the claims, and are cosmetic in nature. No new matter has been added. Reconsideration of the application, as amended, is respectfully requested.

### **Information Disclosure Statement**

The Examiner has indicated he has not considered FR 2 748 184 and FR 2 738 695 and has drawn a line through this reference on Form PTO/SB/08A to indicate these references were not considered because they were not received.

However, MPEP § 609.03 states:

The examiner will consider the documents cited in the international search report in a PCT national stage application *when the Form PCT/DO/EO/903 indicates that both the international search report and the copies of the documents*

*are present in the national stage file. In such a case, the examiner should consider the documents from the international search report and indicate by a statement in the first Office action that the information has been considered.*  
(Emphasis Added)

In the instant application, the Form PCT/DO/EO/903 that was returned to the undersigned on August 22, 2005 indicates that both the international search report and the copies of the documents are present in the national stage file. As a result, it is respectfully requested that the Examiner consider the documents from the international search report, i.e., FR 2 748 184 and FR 2 738 695, and indicate by a statement that these reference have been considered without requiring Applicants to file a copy of each reference.

#### **Overview of the Office Action**

Claims 1, 4-5, 8-10, 12-13, 40-41 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 5,734,715 (“*Scalart*”), while claims 22, 27-29, 31, 33 and 34 stand rejected under 35 U.S.C. 103(a) as obvious over *Scalart* in view of U.S. Patent No. 5,371,789 (“*Hirano*”).

Applicants have carefully considered the Examiner’s rejections and the comments provided in support thereof. For the following reasons, Applicants assert that all claims now presented for examination in the present application are patentable over the cited art.

#### **Descriptive Summary of the Prior Art**

*Scalart* discloses a process of adaptive identification for estimating the response of a system to an input signal, which comprises receiving the input signal and an observation signal, a component of which is the response to the input signal, determining an error signal by subtracting from the observation signal the input signal filtered by an identification filter with

finite impulse response representative of the response of the system, and adapting coefficients of the identification filter based on the input signal, the error signal and an adaptation stepsize (see col. 3, lines 6-17).

*Hirano* discloses a multi-channel echo canceller that can adapt itself to changing acoustic parameters at the distant end of a communication channel (see col. 1, lines 9-11).

### **Summary of the Subject Matter Disclosed in the Specification**

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

The specification discloses, for example, an echo processing device for attenuating echo components of a direct signal  $X1n$  in a return signal  $Y2n$ , which comprises:

means for calculating a receive gain  $Gr_n$  and a send gain  $Ge_n$ ;

first gain application means for applying the receive gain  $Gr_n$  to the direct signal and producing an input signal  $X2n$  emitted into an echo generator system;

second gain application means for applying the send gain  $Ge_n$  to an output signal  $Y1n$  from the echo generator system and producing the return signal  $Y2n$ ;

and

means for obtaining a coupling variable COR characteristic of the acoustic coupling between the direct signal  $X1n$  or the input signal  $X2n$  and the output signal  $Y1n$ , by calculating a correlation between the direct signal  $X1n$  or the input signal  $X2n$  and the output signal  $Y1n$ , said gain calculation means being adapted to calculate the receive gain  $Gr_n$  and the send gain  $Ge_n$  based on the coupling

variable (see paragraph [001] thru paragraph [0019] of U.S. Publication No. 2006/0034355.

Thus, in accordance with the claimed invention, by taking into account the real acoustic coupling between the loudspeaker and the microphone in the device, when controlling the variation of the receive and/or send, gain that is applied automatically adapts the sound quality of the sent signal and the received signal as a function of changes in the acoustic environment of the echo processing device and the relative position of the transducers (loudspeaker(s), microphone(s)) and as a function of the sound reproduction level chosen by the user, for example (see paragraph [0020] of the instant published application).

#### **Patentability of Independent Claims under 35 U.S.C. §102(b)**

##### **Claim 1**

Independent claim 1 has been amended to incorporate the subject matter of dependent claim 4 (now canceled). As a result, amended independent claim 1 now recites that “the coupling variable COR is obtained by calculating the correlation between the direct signal  $X_{1n}$  or the input signal  $X_{2n}$ , and the output signal  $Y_{1n}$ ”. Such a feature is directed to emphasizing that the variable COR is characteristic of the acoustic coupling between a first signal ( $X_{1n}$  or  $X_{2n}$ ) emitted directly or indirectly into the echo generator system (see, e.g., Fig. 1; 26), which is typically delivered to a loudspeaker, and a second signal ( $Y_{1n}$ ) output from the echo generator system which is typically obtained from a microphone. In accordance with the claimed invention defined by amended claim 1, the gain calculation means are adapted to calculate the receive gain  $Gr_n$  and the send gain  $Ge_n$  based on the acoustic coupling variable (COR).

Claims 1-3 and 7-8 are directed to an echo processing device as shown, for example, in

FIG. 1 and described, for example, at paragraphs [0067] thru [0071] of the instant published application. Dependent claim 9 is directed to an echo processing device as defined by claim 1, but further comprising an echo canceller. An echo processing device as defined by claim 9 is shown in FIG. 2 and described, for example, at paragraphs [0088] thru [0089] of the instant published application. No new matter has been added.

*Scalart* (cols. 11 and 12; FIG. 3) teaches an echo canceller that comprises means (80) for calculating the reception ( $Gr_t$ ) and transmission ( $Gt_t$ ) gains based on an adaptation variable  $\mu_t$  that is used to determine the values of gains. Specifically, *Scalart* (col. 11, line 63 thru col. 12, line 5; FIG. 4, step 5) teaches that the adaptation variable  $\mu_t$  is calculated according to the following equation:

$$\mu_t = \frac{a}{c + d \cdot P2_t / P1_t},$$

where a, c and d denote positive constants, and  $P1_t$  and  $P2_t$  are the estimate of the power of the input signal  $x'_t$  and the estimate of the power of the observation signal  $y_t$ , respectively. *Scalart* thus teaches that the adaptation variable  $\mu_t$  depends only on the ratio  $P2_t/P1_t$  of the estimated energies of an observation signal  $y_t$  (arguably corresponding to output signal  $Y1n$  of Applicant's claimed invention) and the input signal  $x'_t$  (arguably corresponding to input signal  $X2n$  of Applicant's claimed invention). Consequently, the adaptation variable  $\mu_t$  used in *Scalart* to calculate the reception and transmission gains, does not provide characteristics of the acoustic coupling of the input signal  $x'_t$  and the observation signal  $y_t$ .

In contrast, the variable COR recited in amended independent claim 1 defines the characteristics of the acoustic coupling between the direct signal  $X1n$  or the input signal  $X2n$ , and the output signal  $Y1n$ , because the variable COR is obtained by a correlation calculation

between the direct signal  $X1n$  or the input signal  $X2n$ , and the output signal  $Y1n$ , as recited in amended independent claim 1.

In the system disclosed in *Scalart*, however, the signals are analyzed only with respect to their energy content to calculate the adaptation variable. However, in accordance with the claimed invention, where a correlation calculation is used to obtain the variable COR, analysis of the signals in the time domain is also taken into account. The skilled person would readily appreciate that correlation occurs in the time domain, which is fundamental to signal processing. In fact, as shown in the equation recited in dependent claim 6, which is directed to a particular embodiment for a correlation calculation in accordance with the claimed invention, the indices "i" and "j" illustrate this time aspect of the signal analysis, where "i" represents a sampling time in the calculation time window and "j" represents a shift value between the two signals.

By taking into account the real acoustic coupling between transducers within the echo processing device of the claimed invention, such as a loudspeaker and a microphone of a single-channel echo generating system, when controlling the variation of the receive and/or send gain that is applied, the sound quality of the sent signal and the received signal is automatically adapted as a function of changes in the acoustic environment of the echo processing device and the relative position of the transducers (loudspeakers(s), microphone(s)) and also, for example, as a function of the sound reproduction level chosen by the user.

Applicants respectfully assert that *Scalart* fails to teach or suggest the claimed features that the gain calculation means are adapted to calculate the receive gain  $Gr_n$  and the send gain  $Ge_n$  based on a coupling variable COR which is characteristic of the acoustic coupling between the direct signal  $X1n$  or the input signal  $X2n$  and the output signal  $Y1n$ , and which is obtained by calculating a correlation between the direct signal  $X1n$  or the input signal  $X2n$  and the output

signal  $Y1n$ , as recited in amended independent claim 1. Independent claim 1 is therefore patentable over *Scalart* for at least this reason.

### **Claim 10**

Independent claim 10 has been amended to incorporate the subject matter of dependent claim 12 (now canceled). Thus, similarly to amended independent claim 1, independent claim 10 recites that “the first coupling variable COR2 is obtained by calculating a correlation between the input signal  $X2n$  and the signal  $Y3n$ ” from the echo generator system.

Claims 10-15 are directed to an echo canceller, such as shown in FIG. 3 and described, for example, at paragraphs [0094] thru [0095] of the instant published application. Dependent claims 16-19 are directed to an echo canceller as defined by claim 10, but further comprising means for calculating a second coupling variable COR. An echo canceller as defined by claims 16-19 is shown in FIG. 4 and described, for example, at paragraphs [0112] thru [0115] of the instant published application. No new matter has been added.

In accordance with the claimed invention, the adaptation step  $\mu_n$  of the identification filter is calculated as a function of the estimated power  $P1n$  of the input signal  $X2n$ , the estimated power  $P3n$  of signal  $Y3n$ , and as a function the first coupling variable COR2. An embodiment of a calculation of the filter adaptation step of the invention is provided by the equation set recited in dependent claim 11.

*Scalart* (FIG. 2) teaches an echo canceller that comprises an identification filter (18), a subtractor (20), a unit (22) for updating the identification filter as a function of an adaptation stepsize  $\mu_t$ , and a unit (28) for calculating the adaptation stepsize. *Scalart* (col. 9, lines 59-60; FIG. 2) teaches that the adaptation stepsize is also calculated according to the same formula:

$$\mu_t = \frac{a}{c + d \cdot P_{2t} / P_{1t}},$$

with a, c and d being positive constants, and,  $P_{1t}$  and  $P_{2t}$  being respectively the estimate of the power of the input signal  $x_t$  and the estimate of the power of the observation signal  $y_t$  (also see col. 12, and line 11, line 63 thru col. 12, line 5).

Thus, based on the above formula, *Scalart* teaches that the adaptation stepsize  $\mu_t$  is only a function of the estimated powers  $P_{1t}$  and  $P_{2t}$  of the input signal  $x_t$  and the observation signal  $y_t$ . In contrast, however, the adaptation step  $\mu_n$  of the claimed invention is additionally calculated as a function of the coupling variable COR2, which is obtained by a correlation calculation between the signals  $X_{2n}$  and  $Y_{3n}$ , as defined by amended independent claim 10. *Scalart* accordingly fails to teach or suggest this limitation.

#### **Claims 40-41**

Independent claim 40 has been amended to recite that “the first and second coupling variables COR and COR2 are obtained by calculating a correlation between the direct signal  $X_{1n}$  or the input signal  $X_{2n}$ , and the output signal  $Y_{1n}$  (COR), and calculating the correlation between the input signal  $X_{2n}$  or the direct signal  $X_{1n}$ , and the signal  $Y_{3n}$  (COR2).

Amended claim 40 is directed to an echo processing device which combines an echo processing device as defined by claim 1 and an echo canceller as defined by independent claim 10. Such a device is shown in FIG. 5 (which is a combination of FIGS. 1 and 4) and described, for example, at paragraph [0121] thru paragraph [0122] of the instant published application.

Dependent claim 41 is also directed to the device shown in FIG. 5, and to the echo processing of claim 40 in which the adaptation step of the identification filter is calculated also as a function of the first coupling variable. The device defined by claim 41 thus combines the



devices respectively defined by independent claim 1 and dependent claim 16. No new matter has been added.

The above-remarks with respect to independent claims 1 and 10 apply equally to the application of *Scalart* with respect to amended independent claim 40. *Scalart* fails to teach or suggest an echo processing device which combines the features of Applicants' disclosed gains application means and identification filter, whose gains or adaptation step are respectively calculated based on a coupling variable (COR, COR2) as recited in amended independent claim 40. *Scalart* therefore fails to teach or suggest independent claim 40 for at least this reason.

In view of the foregoing, reconsideration and withdrawal of the rejection of claims 1, 10, 31 and 40 as anticipated by *Scalart* under 35 U.S.C. §102 are requested, and a notice to that effect is earnestly solicited.

Moreover, by virtue of the above-discussed differences between the recitations of claims 1, 10, 31 and 40 and the teachings of *Scalart*, and the lack of any clear motivation for modifying *Scalart* to achieve Applicants' claimed invention, independent claims 1, 10, 31 and 40 are also patentable over *Scalart* under 35 U.S.C. 103.

#### **Patentability of Independent Claims 22 and 31 over the Prior Art under 35 U.S.C. §103**

Independent claims 22 and 31 has been amended to incorporate the subject matter of dependent claims 28 and 33. Dependent claims 22 and 31 now recite that each coupling variable  $COR(j,i)$  is obtained by calculating a correlation between the (corresponding) output signal  $Y1n(j)$  and the (corresponding) input signal  $X2n(i)$ , where dependent claim 22 includes the additional term "corresponding", as shown in the parenthesis.

Claims 22-30 are directed to an echo processing device for a multichannel communications system, which applies in multichannel applications of the single-channel echo processing device defined by amended independent claim 1. A device as defined by claims 22-30 is shown in FIG. 6 and described, for example, at paragraph [0129] thru [0134] of the instant published application.

Claims 31-39 are directed to an echo canceller for a multichannel communications system, which applies in multichannel applications of the single-channel echo canceller defined by independent claim 10. Such a device is illustrated in FIG. 7 and described, for example, at paragraph [0149] thru [0150] of the instant published application. Accordingly, no new matter has been added.

The Examiner (at pgs. 6 and 8 of the Office Action) has acknowledged that *Scalart* fails to teach or suggest “an echo canceller for multi-channel systems”, as recited in independent claims 22 and 31, but states that this feature would have been obvious based on the teachings of *Hirano*. Applicants disagree.

*Hirano* (col. 2, lines 7-9) teaches that the filter coefficients of adaptive filters are switched from one vector to another in response to a talker’s movement at the distant end of a communication channel. However, *Hirano* fails to teach or suggest anything whatsoever with respect to each coupling variable  $COR(j,i)$  being obtained by calculating a correlation between a (corresponding) output signal  $Y1n(j)$  and a (corresponding) input signal  $X2n(i)$ , as recited in independent claims 22 and 31. *Hirano* thus fails to provide what *Scalart* lacks. As a result, independent claims 22 and 31 are patentable over the combination of *Scalart* and *Hirano*.

Reconsideration and withdrawal of the rejection of claims 22 and 31 under 35 U.S.C. §103 are requested, and a notice to that effect is earnestly solicited.

### **Dependent Claims**

In view of the patentability of independent claims 1, 10, 22, 31 and 40, for at least the reasons presented above, each of dependent claims 2-3, 5-11, 13-19, 23-27, 29-32 and 34-39 and 41 is believed to be patentable therewith over the prior art. Each of dependent claims 2-3, 5-11, 13-19, 22-27, 29-32 and 34-41 additionally includes features that serve to still further distinguish the claimed invention over the applied art.

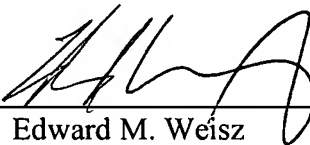
### **Conclusion**

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited.

Should the Examiner have any comments, questions, suggestions or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

Respectfully submitted,  
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